European Research Studies Journal
Volume XXIII, Issue 4, 2020

pp. 931-946

Analysis of Szczecin Metropolitan Area's Growth Potential

Submitted 28/07/20, 1st revision 25/08/20, 2nd revision 27/09/20, accepted 30/10/20

Grażyna Karmowska[1] Andrzej Sobczyk[2]

Abstract:

Purpose: *The purpose of the article is to assess the demographic and economic situation of the Szczecin Metropolitan Area (SMA) with the application of mathematical models that served as the basis for classifying individual communes of the SMA into typological groups with similar demographic and economic potential.*
Design/Methodology/Approach: *To ensure the most objective description of the said phenomena, statistical indicators (selected mostly based on their availability at the level of commune and repeatability over the study period) were used and assigned to specific areas. The main data source was the Local Data Bank kept by the Central Statistical Office of Poland (GUS). Classical statistical methods and multidimensional analysis were employed to analyze the variables. Variability analysis and correlation analysis were used to select variables for analysis. The zero unitarization method was applied to standardize variables.*
Findings: *Research findings confirmed the hypothesis that the demographic and economic situation of the SMA is rather varied, i.e., the lowest demographic potential is observed in the large cities of the SMA, whereas the highest demographic potential is recorded in communes adjacent to the large cities. In contrast, the highest economic potential is found in the largest cities of the Szczecin Metropolitan Area.*
Practical Implications: *From the socio-economic perspective, local communities' demographic potential is an important component of the development opportunities of a region.*
Originality/value: *The methodology employed for the analysis proved that demographic changes have and will continue to impact decision processes about a specific area and the overall socio-economic well-being of the metropolitan area.*

Keywords: *Development potential, demographic potential, economic potential.*

JEL classification : *J23, R11.*

Paper Type: *Research study.*

Acknowledgments: *Article financed as part of the Department's research titled Supporting regional development by monitoring the socio-economic situation.*

[1]*Prof. Economics/Department of System Analysis and Marketing, Faculty of Economics, West Pomeranian University of Technology, Szczecin, Poland,*
e-mail: gkarmowska@zut.edu.pl;
[2]*PhD Economics//Department of System Analysis and Marketing, Faculty of Economics, West Pomeranian University of Technology, Szczecin, Poland,*
e-mail: asobczyk@zut.edu.pl;

1. Introduction

Regional analyses recognize the core significance of cities for regional development. They focus on cities' role and function in innovation, production, and distribution processes. Cities are hubs in global networks, where global and regional capital flows and labor movements are localized. Understanding the specificity of how cities impact regional development is a theoretical and analytical objective for regional studies (Clark, Harrison, Miguelez, 2018). Cities are economic drivers in every country, as they concentrate on social and economic activity allowing for the benefits of the economies of scale and agglomeration to be gained (Villamil, 2010).

The literature concerned with urban development offers an abundance of answers to why cities 'grow' in population, area, and income per capita, or which cities grow the fastest and why. In agglomerations, structural changes and human capital, and the economy are interrelated and do not yield an easy picture on which to build a clear monocentric city model (Duranton and Puga, 2013)

The development potential of cities mainly depends on its demographic situation, its ability to 'attract' new inhabitants, and the local community's ability to restore itself. Three serious processes shape the area's population: aging workforce, dropping natural increase rates, and migration. Demographic changes exert and will continue to influence decision-making processes in the given area and how their socio-economic life develops. This means changes to the local economic structure, demand for public services, demand in the real estate market, workforce supply, and the size of the inhabitants' income and the local authorities' budgets. To be able to draw up strategic socio-economic development plans in a few or several years, local authorities not only need to have a thorough knowledge of the basic demographic processes and structures before the plans' starting dates, but also an ability to make in-depth forecasts of their future developments (Holzer, 2003).

Running a proper and efficient development policy is impossible without reliable, detailed spatially disaggregated information on employment. As the actual population size, along with its qualitative characteristics in the given area, such as the age structure, is the fundamental socio-demographic variable determining a demand for specific public services. In terms of socioeconomic development, local communities' demographic potential is an important factor defining the region's growth opportunities. Areas with relatively favorable sex and age structure, positive population dynamics, and strong demographic processes are best placed. (Szymańska and Michalak, 2011)

The vision of a more sustainable regional development encompasses stressing the local community's sustainability. The need for regional mobility is reduced, and managing the region's land, resources, and population. Regional planning of sustainable development is a tough challenge, and the trend towards ever-larger urbanized regions should be viewed with caution (Wheeler, 2009). Progressive

urbanization itself can be treated as evidence to the advantage of profits over costs achieved through the economy of agglomeration. The advantage derived from the benefits of agglomeration over the negative effects of agglomeration varies due to the substantial diversity of cities and their circumstances. The specificity of the given country or region has its impact, as well. The net agglomeration effects and, at the same time, their role as either driver of or barriers to the city's development can be affected by the city's size and its broadly defined urban space planning that largely comes down to an effective reduction in agglomeration costs, e.g., transport congestion, environmental pollution or crime (Harasimowicz, 2015).

The literature on the subject reports many aspects affecting the development of metropolitan areas. Undoubtedly, a substantial effect is exerted by immigration. Studies on the role of immigration for the growth in productivity and metropolitan areas' economic growth have been carried out by Xiao Hu (2014). His research focuses on the overall effects, skills, and complementarities and makes use of mathematical models. The nature of the changes and the ties between population growth and economic development greatly impact how metropolises develop. Of significance are population changes and their demographic characteristics, namely whether the population grows due to natural increase, immigration, labor migration, or retirement (Pack, 2016). Another aspect affecting population growth is fertility. According to Riederer and Bubber-Ennser (2019), the fertility rate is much higher in rural areas than in cities. Additionally, population development is influenced by how land is used within the agglomeration (Werner, Korcelli, and Kozubek, 2014). The impacts of metropolitan regions on their surrounding areas are presented in a paper by Commission for Territorial Cohesion Policy and EU Budget (2019). A metropolitan region can be defined as a region with densely populated urban cores in conjunction with the suburban zone. Metropolitan areas are the "engines" of development and can spread positive effects from the core city to the suburban zone and their surrounding areas. However, they are also causing unintended unfavorable effects. The main side effects of metropolitan regions to their surrounding areas are:

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by Commission for Territorial Cohesion Policy and EU Budget (2019). A metropolitan region can be defined as a region with densely populated urban cores in conjunction with the suburban zone. Metropolitan areas are the "engines" of development and can spread positive effects from the core city to the suburban zone and their surrounding areas. However, they are also causing unintended unfavorable effects. The main side effects of metropolitan regions to their surrounding areas are:

- Migration from rural areas to cities: metropolitan regions attract people. People migrate from rural peripheral areas to metropolitan regions, swelling the demand for affordable housing in urban areas, and challenging the "shrinking" of rural areas.
- Access to facilities with the highest centrality: metropolitan regions provide a mix of highly specialized facilities with relevance for the whole country, as, e.g., universities, highly specialized hospitals, theaters with nationwide renown, research institutes, etc.
- Societal links: people migrating from rural to urban areas keep social and family ties to their area of origin. A multicultural lifestyle gains in importance, thus putting a strain on transport systems.
- Economic prosperity through agglomeration advantages: metropolitan regions are the economic engines producing a high GDP per person employed, driving a country's economy.
- Cities as regional markets: metropolitan regions are markets for their surrounding areas. In particular, they are potential destinations for short-distance agricultural produce supply.
- Land take and soil sealing: The development of cities within metropolitan regions stimulates land take and soil sealing. This does not only apply to the suburban zone but can also affect municipalities with a highly attractive landscape in the surrounding areas that are targets for the establishment of second homes.
- The distribution of competences challenges sustainable development within a metropolitan region and between such regions and their surrounding areas. Independent municipalities compete for influences, investments, and inflow of residents. Their pursuit of individual benefits leads to an overall unbalanced regional development. Solutions for achieving a more balanced development differ due to the different regional conditions and the government system. This calls for tailored approaches that pay attention to the following issues:
- A common perception of the challenges and shared goals by developing a common spatial analysis and a common urban-rural strategy.
- Finding the appropriate form of cooperation about the needs and preconditions of the metropolitan region's governance system.
- Implementing concrete metropolitan projects (Metropolitan regions, 2019).

Urban area reorganization often leads to counter-urbanization, which changes the downtown's nature to a typical sales administration and service center, but without permanent inhabitants. This causes population movement from highly urbanized zones to small settlements in typically rural areas. As a result, urbanization in the cities is halted in demographic and - partly - economic terms. At the same time, the urban lifestyle is spreading in rural areas. This is referred to as suburbanization. This process requires the development of existing services and the creation of new ones, which drives spatial urbanization.

The contemporary debates surrounding regional issues are more complex than ever in many respects. They are multidisciplinary and multiscale, and the analyzed phenomena themselves are more complicated, as evidenced by numerous empirical and theoretical studies of recent decades (Neuman and Hull, 2009). Research also explores the subject of happiness and well-being at the metropolitan level. The residence is actively chosen by accounting for employment opportunities and the availability of goods and public services. Another aspect of the study is how human capital influences the well-being of cities and metropolitan regions. Higher human capital resources bring better and wider employment opportunities (Florida, Mellander and Rentfrow, 2013).

Da Silva, Elhorst and Da Mota Silveira Neto (2017) have studied urban and rural population growth across a spatial municipality panel. They proposed an economic and theoretical urban population growth model. Their spatial model helped estimate the effects of variables linked to population growth in Brazilian cities between 1970 and 2010. The model contains variables related to local productivity and urban amenities. Metropolises are shaped by the concentrating population, which at the same time spreads to ever larger areas, thus causing fragmentation of elements of space. Given the shrinking human resources and population aging, the role of demographic circumstances is invaluable. This impacts several processes, such as the fertility rate that has been below the so-called generation replacement level for years, population aging, and growing emigration. The fast development of a metropolis with a limited spatial scope and range causes marginalization of its regional surroundings. These processes affect the development potential, mainly depending on the area's demographic situation, its ability to 'attract' new inhabitants, and the local community's ability to restore itself (Sobczyk, 2015).

The present study's main aim was to assess the demographic and economic situation of the Szczecin Metropolitan Area (SMA). The specific objective was to classify individual SMA municipalities into typological groups of similar demographic and economic potential. The SMA's empirical study results were used to verify the assumption that the lowest demographic potential was to be found in the region's main cities and the largest in the municipalities adjacent to the main cities. Another assumption was that the highest economic potential was characteristic of the agglomeration's main cities.

2. Characteristics of the Szczecin Metropolitan Area

The Szczecin Metropolitan Area (SMA) comprises the core – the provincial capital of Szczecin – and its functionally linked surrounding areas. Based on an analysis of functional ties, direct economic links, and a history of cooperation, the following municipalities and communes were included in the area of the strongest links with Szczecin: Dobra (Szczecińska), Goleniów, Gryfino, Kobylanka, Kołbaskowo, Nowe Warpno, Stepnica, Police, Stare Czarnowo, Stargard, as well as the town of Stargard and the town of Świnoujście. SMA's municipalities and rural and rural-urban communes cover a total area of 2,794.51 km (12.2% of the Province's area) with a population of 687,247 as of 12/31/2018 (39.9% of the region's population). Between 1995 and 2018, the SMA increased its demographic potential by 13,472 persons (Table 1).

However, population growth was not seen in all the municipalities. The three largest Szczecin cities, Świnoujście, and Stargard, witnessed a drop in the total population by 9,984, 1,990, and 3,926. The group of localities with shrinking populations also included Nowe Warpno, with a drop of 154 people. The highest population growth was observed for Dobra Szczecińska commune with a 13,396 increase between 1995 and 2013. More growth was seen in Kołbaskowo commune (6,334), Goleniów municipality (+4,357), Kobylanka (2,013), and Stargard rural commune (1,749). In terms of socio-economic development and the economics of public services, the analysis of population changes must be broken down into the functional groups of pre-working age, working age, and retired people. In the analysis (1995-2019), these changes were not uniform across the SMA, and a clear demographic structure polarization was observed (Figure 1).

While the working-age population grew by 4.88% from 1995 to 2018, the retired population went up by 59.22% (an increase of 48,913 people). In turn, the pre-working age population declined by 55,996 people (or 32.88%) across the same period. The area's population aging rate and the decline in its natural increase rate are presented in Figure 1. Since 1995, the number of pre-working age people has been in steady decline, accompanied by an increase in the retired population. In 1995, the SMA had a youth population of 170,301 and an elderly population of 82,594, but in 2018 there were 114,305 young people (a drop of 33%) and 131,508 elderly persons (an increase of 37%). The growth in the retired population was observed for all the SMA's municipalities and communes. The youth population decline did not affect all the communes. On the contrary, three of them showed an increase: Dobra (+2,801), Kołbaskowo (+955), and Kobylanka (+146). These communes are in the closest vicinity of Szczecin and Stargard, thus draining the cities' potential. Table 2 shows the cumulative measures characterizing the SMA's demographic potential changes between 2003 and 2018. Szczecin and Świnoujście's unfavorable demographic situation result from adverse natural increase dynamics, negative net migration rates, decreased fertility rates, and a higher retirement-age population to total population ratios (population aging). The higher demographic potential of the neighboring

municipalities and communes is mostly driven by their higher natural increase and net migration rates. Although all the SMA's municipalities and communes are challenged by population aging, Szczecin, Świnoujście, and Stargard are the most affected.

Table 1. *SMA population between 1995 and 2018*

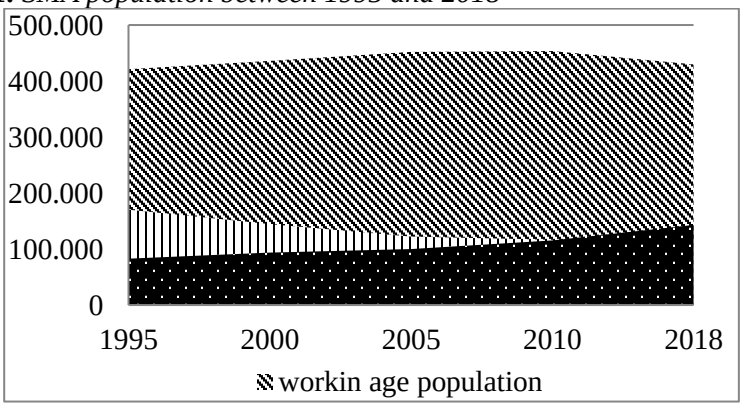
	1995	2000	2005	2009	2018
Dobra	5,905	8,620	11,892	15,581	19,301
Goleniów	31,176	31,757	33,029	34,090	35,533
Gryfino	31,283	31,061	31,296	31,469	32,147
Kobylanka	2,892	3,117	3,626	4,191	4,905
Kołbaskowo	5,265	7,155	8,595	10,061	11,599
Szczecin	418,156	416,657	411,119	406,307	408,172
Świnoujście	43,361	42,207	40,933	40,765	41,371
Nowe Warpno	1,826	1,616	1,559	1,641	1,672
Police	41,477	41,198	41,416	41,804	41,911
Stare Czarnowo	3,858	3,864	3,885	3,781	3,875
Stargard (m)	73,254	71,374	70,639	69,870	69,328
Stargard	10,827	11,027	11,293	11,673	12,576
Stepnica	4,495	4,634	4,687	4,746	4,857
Total for SMA	673,775	674,287	673,969	675,979	687,247

	2018-1995 Rate of change	2018-1995 Difference
Dobra	326.86	13,396
Goleniów	113.98	4,357
Gryfino	102.76	864
Kobylanka	169.61	2,013
Kołbaskowo	220.30	6,334
Szczecin	97.61	-9,984
Świnoujście	95.41	-1,990
Nowe Warpno	91.57	-154
Police	101.05	434
Stare Czarnowo	100.44	17
Stargard (m)	94.64	-3,926
Stargard	116.15	1,749
Stepnica	108.05	362
Total for SMA	102.00	13,472

Note: *(m) - town*

Source: *Developed by the author based on GUS Local Data Bank. www.stat.gov.pl, accessed in January 2015.*

Figure 1. *SMA population between 1995 and 2018*



Source: *Developed by the authors based on GUS Local Data Bank. www.stat.gov.pl*

Table 2. *Cumulative demographic measures for the SMA*

SMA Cities, Towns and Villages	Sum of Natural Increase per 1,000 Inhabitants between 2003 and 2018	Sum of Net Migration per 1,000 Inhabitants between 2003 and 2018	Mean Fertility Rate between 2003 and 2018
Dobra	66.60	649.60	1.25
Goleniów	28.40	61.00	1.51
Gryfino	25.50	-12.60	1.39
Kobylanka	19.90	357.70	1.31
Kołbaskowo	100.10	287.10	1.56
Szczecin	-18.30	-5.80	1.17
Świnoujście	-19.40	2.30	1.23
Nowe Warpno	-7.30	11.40	1.24
Police	33.50	-22.40	1.34
Stare Czarnowo	11.40	-2.40	1.32
Stargard (m)	12.00	-42.10	1.28
Stargard	24.40	66.70	1.50
Stepnica	-0.20	6.00	1.36

	Difference in the Retirement-Age Population to Total Population Ratio between 2003 and 2018	Difference in the Persons Aged 25-34 per 1,000 Inhabitants Ratio between 2003 and 2018
Dobra	0.02	-44.89
Goleniów	0.04	11.29
Gryfino	0.06	7.68
Kobylanka	0.01	2.46
Kołbaskowo	0.01	-14.58
Szczecin	0.05	11.67
Świnoujście	0.07	1.27
Nowe Warpno	0.03	14.72
Police	0.05	30.69
Stare Czarnowo	0.05	3.57
Stargard (m)	0.07	10.64
Stargard	0.00	23.89
Stepnica	0.02	27.45

Source: *Developed by the authors based on GUS Local Data Bank. www.stat.gov.pl*

3. Materials and Methods

For these analyses to be accurate, an appropriate selection was required of input data to provide a reliable and possibly holistic reflection of the processes occurring within the studied areas. To ensure as objective a description of these phenomena as possible, statistical indicators attributed to specific areas were analyzed (mainly as to their availability at the municipality level and repeatability over the period of study). The data were mostly obtained from the GUS (Statistics Poland) Local Data Bank. The variables were described and analyzed using statistical, econometric, and multivariate analysis methods. The variables were selected for analysis based on variability analysis and correlation analysis. Values below 15% were assumed as the variability criterion. The zero unitarization method was used for data standardization (Kukuła, 2000). In this method, different variables with different units are brought to comparability as they are deprived of their units. Consequently, it becomes possible to make multi-criteria assessments of units and compare them concerning the chosen complex phenomenon. The standardized variables z_{ij} were calculated based on the formulas for stimulants (1) and destimulants (2):

$$z_{ij} = \frac{x_{ij} - \min\limits_{i} x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}}; \quad \max\limits_{i} x_{ij} \neq \min\limits_{i} x_{ij}, \tag{1}$$

$$z_{ij} = \frac{\max\limits_{i} x_{ij} - x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}}; \quad \max\limits_{i} x_{ij} \neq \min\limits_{i} x_{ij}' \tag{2}$$

Subsequently, taxonomic measures of development were estimated (3) and used to build demographic and economic indexes and rankings and to classify the units.

$$q_i = \frac{1}{s}\sum_{j=1}^{s} z_{ij}; \quad \bar{q} = \frac{1}{r}\sum_{i=1}^{r} q_i; \quad S(q) = \left[\frac{1}{r}\sum (q_i - \bar{q})^2\right]^{0,5} \tag{3}$$

The units were divided into 4 classes (Table 3). Subsequently, the estimated synthetic variables were used to build rankings and classify the units. Separate variables were built for the demographic area and the economic area. The units were divided into 4 classes:

- One of high economic/demographic potential (class 1), one of above-average potential (class 2)
- One of the average potential (class 3)
- One of the low potential (class 4)

Table 3. *Classes of the units*

Group	Class Interval	Development Level
I	$q_i \geq \bar{q} + S(q)$	high
II	$q_i \in \langle \bar{q}, \bar{q} + S(q)) \rangle$	above average
III	$q_i \in \langle \bar{q} - S(q), \bar{q}) \rangle$	below average
IV	$q_i < \bar{q} - S(q)$	low

Source*: Karmowska 2013, p.9*

The next step was to collate the units for both the areas and compare their changes between 2012 and 2018.

4. Study Results

The study included 13 localities of the Szczecin Metropolitan Area (SMA). The analysis focused on two areas: demographics and the economy. To describe the economic potential, 8 variables were proposed, of which 6 were stimulants, and 2 were de stimulants (Table 4).

Basic statistics for the proposed variables are shown in Table 5. All the proposed economic variables demonstrated variability exceeding 15%, while correlation analyses allowed four variables – E2, E3, E5, and E8 – to qualify for further analysis. The cities, towns, and villages of the Szczecin Metropolitan Area were ranked using the synthetic variable describing the economic potential (EP) (Table 6). Seven localities maintained their position in the ranking, but four others declined. In 2012, Szczecin held the highest position in terms of economic potential, to fall by as many as 5 positions after 6 years. Interestingly, Kołbaskowo progressed by as many as 9 positions, and Police by 3.

According to the assumed methodology, the SMA localities were divided into 4 classes (Table 7). In both the study years, Świnoujście was the only one to remain in class 1, with the other localities falling to class 2 in 2018. From among the localities of a below-average potential, Kołbaskowo alone progressed to class 1. All the proposed economic variables demonstrated variability exceeding 15%, while correlation analyses allowed four variables – E2, E3, E5, and E8 – to qualify for further analysis. The cities, towns, and villages of the Szczecin Metropolitan Area were ranked using the synthetic variable describing the economic potential (EP) (Table 6). Seven localities maintained their position in the ranking, but four others declined. In 2012, Szczecin held the highest position in terms of economic potential, to fall by as many as 5 positions after 6 years. Interestingly, Kołbaskowo progressed by as many as 9 positions, and Police by 3.

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Table 4. *Economic variables*

Symbol	Economic Variables	Analysis Period		Variable Type
E1	Capital expenditure per capita from the municipal budget	2012	2018	S
E2	Own revenue per capita of the municipal budget	2012	2018	S
E3	The employed per 1,000 inhabitants	2012	2018	S
E4	Number of national economy entities per 1,000 inhabitants	2012	2018	S
E5	Newly registered national economy entities per 1,000 inhabitants	2012	2018	S
E6	Number of self-employed natural persons per 1,000 inhabitants	2012	2018	S
E7	Number of the registered unemployed per 1,000 working-age people	2012	2018	D
E8	Percentage of the long-term unemployed (out of the total number of the unemployed)	2012	2018	D

Note: *BG - municipal budget*
Source*: Developed by the authors.*

Table 5. *Statistics for economic variables in 2012 and 2018*

	STATISTICS	E1	E2	E3	E4	E5	E6	E7	E8
2012	mean	2.25	4,03	172	126	12.2	99	77	0.49
	deviation	3.66	5,22	61	29.8	3.0	24	17	0.07
	variation	163%	129%	35%	24%	24%	25%	22%	14%
	max	14.48	21,52	290	186	20.2	157	117	0.62
	min	127	1.18	67	77	8.5	64	52	0.37
	range	14.36	20.33	223	109	11.7	94	66	0.26
2018	mean	1.45	3,19	227	132	12.7	103	31	0.60
	deviation	705	1,08	118	31	3.4	26	11	0.11
	variation	48%	34%	52%	23%	26%	25%	34%	18%
	max	3.02	6,40	522	198	17.9	168	63	0.82
	min	614	1.91	70	89	7.04	73	19	0.41
	range	2.41	4.49	452	110	11	95	43	0.41

Source: *Developed by the authors.*

Table 6. *SMA city, town and village ranking according to economic potential*

SMA Cities, Towns and Villages	Rankings		Differences in Rankings
	2012	2018	
Goleniów	3	3	0
Stepnica	8	9	-1
Gryfino	6	10	-4
Stare Czarnowo	13	13	0
Dobra (Szczecińska)	5	5	0
Kołbaskowo	10	1	9
Nowe Warpno	9	11	-2
Police	11	8	3
Stargard (m)	7	7	0
Kobylanka	4	4	0
Stargard	12	12	0
Szczecin	1	6	-5
Świnoujście	2	2	0

Source: *Developed by the authors.*

Table 7. *Classes according to the economic potential*

Class	2012	2018
1	Świnoujście, Szczecin, Goleniów, Kobylanka	Kołbaskowo, Świnoujście
2	Dobra (Szczecińska)	Goleniów, Kobylanka, Dobra (Szczecińska), Szczecin,
3	Stepnica, Gryfino, Kołbaskowo, Nowe Warpno, Stargard (m), Police,	Stepnica, Stargard (m), Police
4	Stargard, Stare Czarnowo	Nowe Warpno, Stargard, Gryfino, Stare Czarnowo,

Source: *Developed by the authors.*

To describe the demographic potential, 6 variables were proposed, of which 2 were stimulants, and 4 were de stimulants (Table 8). Basic statistics for the proposed variables are shown in Table 9.

Out of the proposed demographic variables, only D3 had variability below 15% and was thus excluded from further analysis. After correlation analysis, D5 was excluded, as well. The remaining variables were used to build a synthetic one describing the demographic potential. Table 10 shows the localities ranked by their demographic potential.

The locality demographic potential ranking was subject to much change between 1995 and 2012. In 1995, the highest position was held by Kobylanka, which fell to 10th place in subsequent years. From its 9th place in 1995, Szczecin moved to the 1st in 2012, only to later drop to the 12th. Goleniów ranked 1st in 2012 and 2018. The remaining localities kept their positions, as well.

According to the assumed methodology, the SMA localities were divided into 4 classes according to their demographic potential (Table 11). Considerable movement between the classes was observed in 1995, 2002, and 2012. In 1995, the metropolis's largest cities and towns were in class 3 of below-average demographic potential. In 2002, Szczecin moved to class 1, Świnoujście to class 2, and Stargard remained in class 3. 2012 saw further shifts in the demographic potential. Stargard reached the highest values (and entered class 1) as Szczecin fell to class 2 and Świnoujście to class 4. The next years were practically marked by demographic potential stagnation. There was only a slight movement between the classes, and the potential remained comparable to that of 2012. The analyses were summarized by collating the units for both the demographic and economic areas. Dictated by data availability, the SMA's demographic and economic potentials were compared for 2012 and 2018, as shown in Figures 2 and 3.

The first quarter contains localities with the highest economic (EP) and demographic potential (DP) of more than 50%. The second quarter groups localities of a high economic (EP>50%) potential and a demographic potential (DP) of <50%. The third quarter contains localities with the lowest economic (EP) and demographic potential (DP) of <50%. The fourth quarter groups localities of a low economic (EP<50%) and high demographic (DP>50%) potential.

In 2012, the two potentials exceeding 50% were only seen in Szczecin, which in 2018 moved to the 4th quarter. Stepinac, Goleniów, and Gryfino took over its place. In 2018, the agglomeration's largest cities were characterized by potentials below 50%.

Table 8. *Demographic variables*

Variable Symbol	Demographic Variables	Years of Analysis		Variable Type
D1	natural increase per 1,000 inhabitants	1995	2018	S
D2	net migration per 1,000 inhabitants	1995	2018	D
D3	Economic dependency ratio	1995	2018	D
D4	Population aging rate (retirement population to pre-working age population ratio)	1995	2018	D
D5	Demographic rate of aging (retirement population to total population ratio)	1995	2018	D
D6	Population density - people per 1 square km	2002	2018	S

Source: *Developed by the authors.*

Table 9. *Statistics for demographic variables in 1995, 2002, 2012 and 2018*

Statistics	D1	D2	D3	D4	D5	D6
			1995			
mean	3.79	5.72	0.67	0.32	0.11	
deviation	2.41	15.58	0.07	0.15	0.02	
variability	0.64	2.72	0.10	0.47	0.18	
max	7.98	41.60	0.78	0.60	0.14	
min	-0.82	-10.95	0.53	0.00	0.07	
range	8.80	52.55	0.25	0.60	0.06	
			2002			
mean	2.02	6.80	0.55	0.43	0.12	285
deviation	2.99	15.06	0.06	0.22	0.02	493
variability	1.48	2.21	0.10	0.52	0.21	1.73
max	9.30	47.57	0.68	0.90	0.17	1483
min	-2.16	-6.19	0.49	0.00	0.08	8
range	11.46	53.76	0.19	0.90	0.09	1475
			2012			
mean	1.36	6.36	0.51	0.79	0.15	292
deviation	3.30	13.46	0.03	0.29	0.03	479
variability	2.42	2.12	0.05	0.36	0.23	2
max	8.53	42.82	0.56	1.35	0.20	1450
min	-2.96	-4.14	0.46	0.36	0.08	9
range	11.49	46.95	0.00	0.99	0.12	1441
			2018			
mean	-0.23	7.01	0.61	1.12	0.19	292
deviation	3.57	11.67	0.05	0.37	0.04	467
variability	-15.35	1.67	0.09	0.34	0.22	2
max	8.29	33.74	0.69	1.78	0.26	1413
min	-5.26	-3.90	0.52	0.52	0.12	8
range	13.55	37.64	0.17	1.25	0.14	1405

Source*: Developed by the authors.*

Table 10. *SMA cities, towns and villages ranked by their demographic potential in 1995, 2002, 2012 and 2018*

SMA Cities, Towns and Villages	Rankings				Differences in Rankings	
	1995	2002	2012	2018	2012-2018	2002-2018
Goleniów	4	5	1	1	0	4
Stepnica	5	4	2	2	0	2
Gryfino	7	8	3	3	0	5
Stare Czarnowo	2	3	4	4	0	-1
Dobra (Szczecińska)	13	13	5	5	0	8
Kołbaskowo	12	6	6	6	0	0
Nowe Warpno	8	12	7	7	0	5
Police	11	11	8	8	0	3
Stargard (m)	6	2	9	9	0	-7
Kobylanka	1	10	10	10	0	0
Stargard	3	9	11	11	0	-2
Szczecin	9	1	12	12	0	-11
Świnoujście	10	7	13	13	0	-6

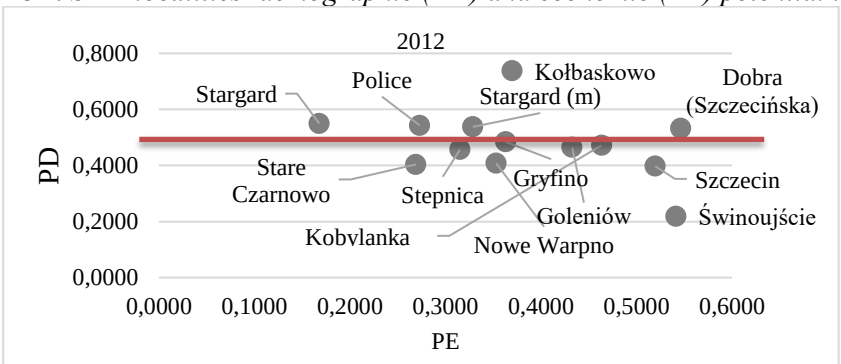
Source: *Developed by the authors.*

Table 11. *Demographic potential classes in the years*

Classes	1995	2002
1	Kobylanka, Stare Czarnowo	Stargard (m), Szczecin
2	Goleniów, Stepnica, Stargard	Goleniów, Stepnica, Gryfino, Stare Czarnowo, Kołbaskowo, Świnoujście
3	Gryfino, Nowe Warpno, Szczecin, Police, Stargard (m), Świnoujście	Police, Kobylanka, Stargard
4	Dobra (Szczecińska), Kołbaskowo	Dobra (Szczecińska), Nowe Warpno
Classes	2012	2018
1	Kołbaskowo, Stargard (m)	Kołbaskowo, Stargard (m)
2	Gryfino, Stargard, Police, Szczecin	Goleniów, Gryfino, Police, Stargard, Dobra (Szczecińska), Szczecin
3	Goleniów, Stepnica, Stare Czarnowo, Nowe Warpno, Dobra (Szczecińska), Kobylanka	Stepnica, Stare Czarnowo, Kobylanka
4	Świnoujście	Nowe Warpno, Świnoujście

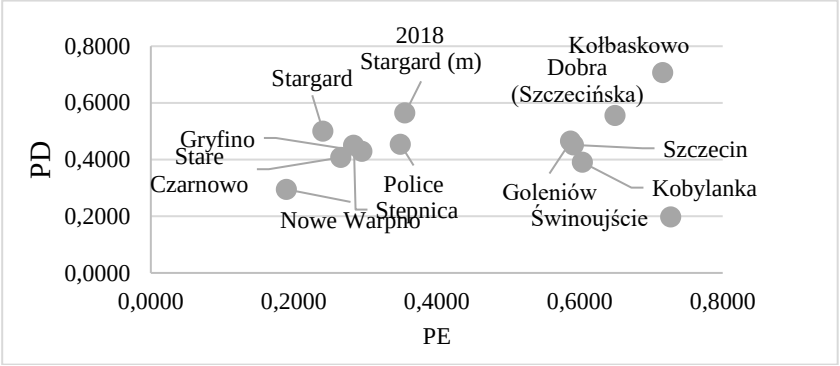
Source*: Developed by the authors.*

Figure 2. *SMA localities' demographic (DP) and economic (EP) potential in 2012*



Source: *Developed by the authors.*

Figure 3. *SMA localities' demographic (DP) and economic (EP) potential in 2018.*



Source: *Developed by the authors.*

5. Concluding Comments

Running a proper and efficient regional development policy is impossible without reliable information on the local communities' demographic potential. It is an essential element of the region's growth opportunities and serves the local authorities in preparing strategic socio-economic development programs. In line with the assumed aim, using a synthetic variable allowed for a comparison between the SMA's localities according to their demographic and economic potentials. The localities were observed to move between the typological groups causing substantial fluctuations (ranking improvements or declines). The thesis that the lowest demographic potential was found in the area's main cities was only proved right for Świnoujście (class 4). Szczecin and Stargard still belonged to a high demographic potential (the 2nd and 1st class, respectively).

The thesis that the highest demographic potential characterized the municipalities and communes adjacent to the main cities was proved right. Kołbaskowo, Gryfino, and Police belonged to the above-average potential classes. The thesis that the agglomeration's main cities demonstrated a higher economic potential was proved wrong. In 2018, only Świnoujście was included in the 1st economic potential class, as Szczecin found itself in class 2 and Stargard in class 3. Our analysis of the SMA's demographic and economic potential pointed to its considerable diversity and dynamic changes occurring throughout the period of study. Although in 2012, the highest levels of both the potentials were demonstrated by the area's two largest centers – Szczecin and Świnoujście – in 2018, they were replaced by Goleniów, Stepnica, and Gryfino.

The study's findings indicate a marked polarization of the demographic and economic potential across the entire metropolitan area. Thanks to their proximity to the agglomeration's large centers, the neighboring municipalities gain insignificance. The demographic potential grew, especially in: Dobra, Kołbaskowo, Gryfino. Some of them benefited from their location rent (e.g., the proximity of transport infrastructure)

to increase their economic potential, such as Goleniów, Stare Czarnowo, and Kobylanka.

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